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CONTENTS, FOREWORD, AND BIBLIOGRAPHY OF THE BOOK  
'SONIC FOCUSsing SYSTEMS'

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L. D. Rozenberg

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The effects of focussing sounds have long been familiar; until recently, however, their application has rarely gone beyond school experiments.

The development of acoustics and acoustical<sup>S</sup> technics, especially the works of recent years in the field of ultrasonics, has needed the extensive application of focussing systems for the solution of many practical problems.

The existing literature on these problems (except parabolic mirrors) is more than meagre. Excluding certain publications of the author and of persons working with him, the literature is limited to less than ten works of great age, describing certain qualitative experiments. The theory, and still less the problems of calculating sonic focussing systems, is not touched on at all.

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Therefore, it is not useless to publish this work, which is a summary of certain materials obtained as a result of labors performed under the direction of the author at the Physical Institute imeni P. N. Lebedev, Academy of Sciences USSR.

Obviously the present work, being the first in this interesting field, cannot pretend in any way to completeness and to an exhaustive solution of the problems touched upon.

The author hopes that he has clarified general positions, noted the scope of the problems relating to the theme, and given solutions of certain of them.

The book is intended, in the main, for the engineer-investigator and project planner (designer); if, however, the book interests a wider circle of physicists and also is a stimulus to further development of this new field of acoustics, which in analogy with electron-optics could be called "sonic optics", the author will consider his work fulfilled.

The experiments described in this book were carried out in cooperation with B. D. Tartakovskiy, A. A. Karpacheva, V. Ya. Eykhengol'ts, Yu. N. Sil'vestrov, and M. G. Sirotyuk.

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Moscow, 10 September 1949.

Physical Institute imeni P. N. Lebedev,  
Academy of Sciences USSR.

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## Bibliography

### I. General Problems

1. Rayleigh. Theory of Sound, Volume II. GTII, Moscow: 1944.
2. Steatt (Rayleigh). Wave Theory of Light. Moscow: 1940.
3. G. S. Gorelik. "Demodulation Analysis of Light". Uspekhi Fizicheskikh Nauk, Volume 34, page 321, 1948.
4. G. S. Gorelik. "Interference, Diffraction, Spectral Resolution in Optics and Radio". Uspekhi Fizicheskikh Nauk, Volume 36, page 407, 1948.
5. P. Debye. "Das Verhalten von Lichtwellen in der Nahe eines Brennpunktes oder einer Brennlinie" [The Behavior of Light Waves in the Neighborhood of a Focus or a Focus Line] Annalen der Physik (4), XXX, 775, 1909.

### II. Quatitative Experiments on the Focussing of Sounds

6. V. I. Lebedev. Historical Experiments in Physics. ONTI, Moscow-Leningrad: 1937.
7. N. Schimank. "Zur Fruhgeschichte der Akustic" [History of Acoustics] Akustische Zeitschrift Volume I, 106, 1936.
8. C. Sondhauss. "Ueber die Refraction des Schalles" [Refraction of Sound] Pogg. Annalen, 85, 378, 1852.
9. N. Gezekhus. "Refraction and Velocity of Sound in Poreus 'Sound-Transmitting' Bodies" ZhEF-KhO, Volume 22, 233, 1890 (read 29 April 1886).
10. Rayleigh. "Diffraction of Sound". Proc. Royal Institute, page 20, 1888.
11. K. A. Leont'yev. "Experimental Investigation of Sonic Fields". ZhEF 2, 213, 1925.
12. J. Obata and Y. Yoshida. "Acoustical Properties of Some Sound Collectors for the Aircraft Sound Locator". Aero. Res. Institute Tokyo Imperial University, 5, 213, 1930.

## RESTRICTED

13. R. Pohlman. "Ueber die Moglichkeit Akustischen Abbildung in Analogie Zur Optischen". ["Possibility of Acoustical Images in Analogy to Optical Images"]. Zs fur Physik; 113, 697, 1939.
14. O. Barbier. "L'ottica degli ultrasuoni e le immagini Ultracustiche". ["The Optics of Ultrasonics and Ultracoustic Images"]. Alta Frequenza, XI, 383, 1944.

III. Parabolic Mirrors Note: After submission of the manuscript to the printers, a work was published by R.C. Coile on parabolic concentrators of sound ("Parabolic Sound Concentrators", - JSMPE, 51, 298, 1948), which was in the main a rather complete survey of works on paraboloids carried out by Soviet and foreign authors.

15. M. Rocard. "Les Paraboloides Acoustiques" Revieu d' Acoustique I, 222, 1932.
16. L. Ya. Gutin. "Theory of Parabolic Concentrators of Sound". IEST, No. 9, 1935, page 9; No. 12, 1935 page 74.
17. Yu. M. Shneyder. "Microphonic Concentrator". ZhTf, V, 855, 1935.
18. L. D. Rozenberg. "Focussing of Sonic Waves by Parabolic Mirrors". ZhTF, 19, 1949.

### IV. Zonal Plate

19. A. A. Karpacheva, L. Ye. Rozenberg, and B. D. Tartakovskiy. "Experimental Investigation of Diffraction at the Focus of a Zonal Plate". Doklady Akademii Nauk SSSR, Volume LVI, 399, 1946.
20. G. D. Malyuzhinets. "Diffraction Close to the Axis of the Zonal Plate". Doklady AN SSSR, LIV, 403, 1946.
21. B. A. Karpacheva, L. D. Rozenberg, and B. D. Tartkovskiy. "Experimental Investigations of the Focussing Properties of Zonal Plates". Doklady AN SSSR, LVII, 329, 1947.

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## RESTRICTED

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V. Sonic Lenses

22. F. Ernst. Ultrasonics Lenses and Transmissions Plates. G. Sci. Inst. XXII, 238, 1945.
23. L. D. Rozenberg. "Transparency of Homogeneous Sonic Lense." Doklady AN SSSR, LVII, 347, 1947.
24. L. D. Rozenberg. "The Sound Wedge and Homogeneous Sonic Lense." ZhTF, XVIII, 11, 1948.

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